SUN-EARTH CONNECTION ADVISORY SUBCOMMITTEE (SECAS) MEETING

Washington, DC
February 19-21, 2003

Letter to Dr. Andrew Christensen, Chair of the Space Science Advisory Committee

Dear Andy,

The Sun-Earth Connection Advisory Subcommittee (SECAS) was very surprised to learn that the paperwork necessary for us to be chartered as a bonafide FACA committee was not in place with the GSA even though this committee has been functioning with the understanding that it was a FACA committee for many years. We urge you to pass the attached letter along to Dr. Richard Fisher, Sun-Earth Connection Director, as official recommendations, as quickly as possible.

Sincerely,

David J. McComas, Chairman
Sun-Earth Connections Advisory Subcommittee

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Dr. Richard Fisher, Director
NASA Headquarters
Sun-Earth Connections Division
Code SS, Office of Space Science
Washington, DC 20546-0001

Dear Dick,

The Sun-Earth Connection Advisory Subcommittee was delighted to find that SEC continues to aggressively pursue its broad-based range of research and flight programs aimed at understanding space physics phenomena from the interior of the Sun to beyond the outer reaches of the heliosphere. After many years of the SEC area being severely understaffed at Headquarters, we were delighted to see that you have been able to assemble a larger and excellent group of IPAs and civil servants to help run this important research area. We urge you to complete your planned hires and finish filling out the SEC team.

In keeping with our previous reports, this letter will focus only on the top few issues that need special or urgent attention. We hope that this format of highlighting the most crucial areas that come out of each meeting will spotlight their urgency and help you focus your limited resources on these most critical issues. We would like to begin our next meeting with a quick review of the progress in each of these identified areas. Finally, in addition to this letter, SECAS also provided numerous written comments and corrections to the OSS Strategy.

Solar Probe Mission Definition

Solar Probe will answer key questions about the heating of the corona and acceleration of the solar wind that can be answered in no other way. Recent progress from SOHO, Ulysses, WIND and ACE has contributed to our understanding of the corona and solar wind, making the need for Solar Probe observations clearer and more urgent. The NRC's Decadal Survey of Space Sciences and NASA's SEC Roadmap have both given high priority to the Solar Probe mission.

Significant new expertise has been gained through experience of the teams that responded to the AO. The 2002 Engineering Study performed by APL/JPL indicates that significantly more mass, power and telemetry will be available to the science payload. Because of the technical challenges of this mission, there is a need to retire risks now through technology development.

In view of these developments, the SECAS recommends that NASA convene a new Science and Technology Definition Team. This team must address the trade-offs among costs, technological constraints and scientific objectives and develop a mission concept that achieves the break-through Solar Probe science. It is therefore important that this team includes people

from the community who have experience with the specific technological challenges and the various scientific opportunities afforded by the Solar Probe mission. **This STDT effort must be integrated with the spacecraft and mission studies, which we recognize may require more resources than a traditional science definition team.**

Jupiter Polar Orbiter Science Definition Team

The SECAS would also like to emphasize the priority of a Jupiter mission. Jupiter offers us the opportunity to study magnetosphere-ionosphere coupling in a rapidly rotating magnetosphere. Unlike the Earth's magnetosphere, which is powered primarily by the solar wind, Jupiter's magnetosphere is powered by planetary rotation. At Jupiter, the primary energy reservoir is Jupiter's rotating plasma disk. A frictional torque in the atmosphere is thought to accelerate Jovian plasma to rotation. This torque is transmitted to the Jovian magnetosphere by field-aligned currents that are thought to be the source of Jupiter's powerful aurora. The proposed Jupiter Polar Orbiter mission will allow us to make *in situ* observations of the current carrying region while imaging the aurora thereby directly observing the physical processes that drive this coupling between the plasma disk and Jupiter's atmosphere. The mission will provide critical measurements for understanding the physics of rapidly rotating planetary bodies. **SECAS recommends that NASA undertake a science and technology definition study of an SEC-focused Jupiter Polar Orbiter mission as the next step in clarifying the science priorities in the context of mission options.**

The Important Role of Explorer Missions in SEC Science

SECAS reaffirms the vital importance of the Explorer mission line for Sun-Earth Connection science. Explorer missions enable frequent opportunities for compelling, focused science questions to be addressed with small- and medium-sized missions (SMEX and MIDEX) that can be developed and launched in short (approximately four-year) timeframes. The Explorer mission line provides important opportunity to respond quickly to new scientific and technical developments augmenting the larger strategic flight missions that characterize the Solar-Terrestrial Probes and the Living with a Star missions. **SECAS underscores the need to allocate sufficient resources to the Explorer line to assure predictable availability, long-term stability, and measured growth.** It is a credit to the Explorer line that the best science is accomplished through competitive selection across the OSS themes. Sun-Earth Connections science advancements rely heavily on that community's continued success in these competitions.

ST-5 Technology Demonstration

SECAS continues to strongly endorse the ST-5 project as a vital path finding demonstration for Sun-Earth connection missions requiring resource-limited microsatellites. The three-spacecraft ST-5 flight mission configuration will validate mission-critical elements (listed in priority order with the first two of nearly equal priority) needed urgently for Magnetospheric Constellation and several other multi-spacecraft SEC missions in the STP queue:

(1) that ~25-kg-class satellites, employing and validating new technologies and capable of research-quality measurements, can be designed, built, and flown;

(2) that the economy of scale in the fabrication of multiple, small satellites can be established credibly; and,
(3) that technical issues associated with the operation of a trail-blazing GTO constellation can be explored and assessed.

To insure the realization of all three of these mission-enabling goals, **SECAS reaffirms its earlier strong recommendation(*) to complete the three-satellite-configuration ST-5 flight project as originally proposed.**

SECAS also recommends that the ST-5 project publicize (e.g., via web pages) the valuable results of its technology developments to the SEC community. We applaud ST-5's considerable successes in developing technologies relevant to the Sun-Earth connection, but are concerned that these developments are not as widely known as they should be. We urge broad dissemination of the status of these technologies in order to fully reap their benefits for planned and future Sun-Earth connection missions.

(*) *Excerpted from an 8/01 Letter from SECAS to George Withbroe:*
"SECAS reiterates its very strong endorsement of ST-5 for the demonstration of mission enabling micro-satellite and constellation-specific technologies that are crucial to the SEC future program. We applaud the demonstration of 25kg class spacecraft carrying a science validation instrument. However, we are concerned that cost growth in this project is endangering the utility of ST-5 in developing and demonstrating the constellation technologies. SECAS advises that it is critical to fly all three spacecraft in order to demonstrate the urgently needed constellation technologies. If cost savings are required in the implementation of ST-5, SECAS strongly recommends that they be taken in other areas that do not affect the constellation aspects of this mission."

Sounding Rockets

For over four decades, NASA's sounding rocket program has provided three vital functions for NASA space science: focused, cutting-edge science experiments; platforms for instrument development; and a unique means of fostering and training young scientists and engineers, especially undergraduate and graduate students. Development of High Altitude Sounding Rockets (HASR) provides a significant new capability for doing Sun-Earth connection science. High-altitude and long-duration observations at a contained geophysical location enables, for example, studies of radiation belts; the auroral acceleration region; and astronomical targets, including the Sun and comets.

SECAS strongly endorses the HASR development, which also promises to fill a gap in NASA's access to space between traditional low-altitude rockets and the SMEX program. This development should proceed at the most expeditious pace consistent with maintaining a constant or increased launch rate for all rockets and maintenance of a solid inventory of rocket motors and subsystems capable of supporting the rocket research program.

Small Launcher Access to Space

SECAS appreciated the briefing by Drs. Karen Poniatowski and Steve Clark. This briefing highlighted many of the issues with the small end of NASA's space launch capability. **The lack of low cost launch capability available and permissible for use on smaller NASA missions continues to be the single largest barrier to be overcome in carrying out an effective and**

efficient Sun Earth Connection program. Probably more so than any of the other Space Science disciplines, SEC depends for much of its strategic program on regular, reliable, low-cost access to space on small launch vehicles and as secondary payloads on other larger launches. While we certainly understand that there is a desire to protect US suppliers against competition from overseas companies and institutions, it is not clear what is to be gained by protecting an area where there is no significant market. **SECAS urges NASA to redouble its efforts to explore innovative ways to preserve and expand the capability for launching small payloads in order to mitigate this critical and urgent problem**.

Finally, we were gratified to have Dr. Weiler visit us and share his perspective on the larger OSS program. Of particular interest were the new Nuclear Mission Concept and Jupiter Mission Instrumentation NRAs that will solicit input on possible Jupiter missions and observations and other missions and observations that may be enabled by the greatly increased power available from such an initiative. **SECAS believes that the SEC community may have much to offer to both the nuclear and Jupiter mission studies and urges NASA to make sure that these NRAs and their review processes are drawn sufficiently broadly that SEC input can be fully solicited and incorporated into these programs.**

On behalf of the entire Sun Earth connection community, we wish to thank you and your staff for an excellent meeting and for allowing us the opportunity to provide a community perspective and advice for your consideration.

Respectfully yours,

David J. McComas, Chairman
Sun-Earth Connections Advisory Subcommittee